APPENDIX D

CONTROL SYSTEMS ENGINEERING DESIGN CRITERIA

D.1 INTRODUCTION

Control of the design, engineering, procurement, and construction activities on the project will be completed in accordance with various predetermined standard practices and project-specific programs/practices. An orderly sequence of events for the implementation of the project is planned consisting of the following major activities:

- Conceptual design.
- Licensing and permitting.
- Detailed design.
- Procurement.
- Construction and construction management.
- Startup, testing, and checkout.
- Project completion.

The purpose of this appendix is to summarize the codes and standards and standard design criteria and practices that will be used during the project. These criteria form the basis of the design for the control systems of the project. More specific design information is developed during detailed design to support equipment and erection specifications. It is not the intent of this appendix to present the detailed design information for each component and system, but rather to summarize the codes, standards, and general criteria that will be used. Codes, standards, and general criteria selected during the detail design phase of the project may vary from the information indicated in this appendix in accordance with specific project or design requirements.

Section D.2 summarizes the applicable codes and standards and Section D.3 includes the general design criteria for general conditions, instruments, modulating type control systems, motor controls, and control equipment locations.

D.2 DESIGN CODES AND STANDARDS

The design specification of all work will be in accordance with the laws and regulations of the federal government and the state of California, and applicable local codes and ordinances. A summary of general codes and industry standards applicable to design and construction follows:

- American National Standards Institute (ANSI).
- American Society of Mechanical Engineers (ASME).
- American Society for Testing and Materials (ASTM).
- The Institute of Electrical and Electronics Engineers (IEEE).
- Instrument Society of America (ISA).

- National Electric Code (NEC).
- National Electric Manufacturers Association (NEMA).
- National Electric Safety Code (NESC).
- National Fire Protection Association (NFPA).
- Scientific Apparatus Makers Association (SAMA).

Other recognized standards will be utilized as required to serve as design, fabrication, and construction guidelines when not in conflict with the above listed standards.

The codes and industry standards used for design, fabrication, and construction will be the codes and industry standards, including all addenda, in effect as stated in equipment and construction purchase or contract documents.

D.3 CONTROL SYSTEMS DESIGN CRITERIA

D.3.1 General Requirements

D.3.1.1 <u>Ambient Conditions</u>

All instrument and control devices will be designed to withstand ambient conditions appropriate to their mounting location or be suitably protected.

D.3.1.2 <u>Power Supplies</u>

All instruments and control devices will be designed to operate on power supplies as follows:

- Electric:
  - 120 volt AC, 60 hertz, single-phase for logic and low torque drives.
  - 125 volt DC for logic and low torque drives.
  - 480 volt AC, 60 hertz, 3-phase for high torque drives.
  - Any voltage required other than the above will be furnished by the equipment supplier.
- Pneumatic:
  - Clean, dry, and oil free instrument air at 70 to 125 psig.

– All necessary pressure reducing controls, where required, will be furnished by the equipment supplier.

D.3.1.3 Standard Ranges of Analog Signals. The ranges of analog signals will normally be as follows:

- Electric - 4 to 20 mA DC.
- Pneumatic - 3 to 15 psig.
- Thermocouple Type E.

The use of any signal range other than the above will be avoided.

D.3.1.4 Contact Ratings

The ratings of all instrument contacts used for alarms and interlocks will have a minimum rating as follows:

Voltage Rating, Volts	Continuous Rating, Amperes	Maximum Rating (Break), Amperes	Switching Rating (Break)
120 AC	5.0	3.0	360 volt-amperes
125 DC	2.5	0.50	63 watts

The ratings of all microprocessor output contacts will be the manufacturer's standard rating.

D.3.2 Instruments

D.3.2.1 Instrument Primary Piping/Tubing (Impulse Lines)

Instrument primary piping/tubing is defined as the piping directly connected to the process, beginning at the outlet of the root valve and terminating at the blowdown valve and at the point of connection to the instrument itself.

Piping will be used exclusively for all measuring devices to be supported on connecting piping. Stainless steel tubing will be used for all other instrument primary lines. Socket weld fittings will be used on tubing having a 0.083 inch or greater wall thickness. Grip type fittings will be used on tubing with a wall thickness of 0.065 inch or less. Changes in instrument primary tubing direction for tubing having a 0.083 inch or greater wall thickness will use tube fittings. All other tubing will be bent.

D.3.2.1.1 <u>Sizes of Instrument Primary Piping/Tubing</u>. Instrument primary piping will not be smaller than the connection at the process pipe root valve and/or the following:

- 3/4 inch for pressure measurement piping with a design pressure equal to or less than 600 psig and a design temperature equal to or less than 750° F.

- 1 inch for pressure measurement piping with a design pressure greater than 600 psig or a design temperature greater than 750° F.

- Flow and level measurement by differential pressure will use primary tubing conforming to the requirements below; however, flange tap connections may be of 1/2 inch size.

- Float actuated level switch devices will be supported on connecting piping not smaller than 1 inch.

- Level controllers and transmitters of the displacement float type will be supported on connecting piping not smaller than 2 inches.

- Instrument columns for float actuated level switches and displacement float devices will be piping of not less than 2 inches.

- Primary piping/tubing internal diameter will not be less than 0.30 inch between the process connection and instrument blowdown valve.

- Instrument tubing will be 1/2 inch OD with a wall thickness of 0.083 inch, 0.065 inch, 0.049 inch, or 0.035 inch as required by the primary piping design pressure and temperature.

D.3.2.1.2 <u>Materials for Instrument Primary Piping</u>. Material for connecting from the process header to the root valve will preferably be the same as that used in the process system to which it is connected. Material for instrument primary tubing will be stainless steel, ASTM A213 GRTP316. Higher strength materials may be substituted in the interest of standardization; however, welding procedures at the point of joining the instrument primary piping/tubing to the process piping must be appropriate to the combination of materials involved. Copper or brass may be used only for compressed air or for water services that use copper or brass process piping.

D.3.2.1.3 <u>Insulation of Instrument Primary Piping/Tubing</u>. Instrument primary piping/tubing connecting to high temperature systems, which might become hot enough to injure personnel during blowdown of the instrument line, will be insulated where such hazard exists. Insulation materials, exterior finish, and metal lagging will conform to the standards adopted for the process piping.

D.3.2.1.4 Criteria for Routing of Instrument Primary Piping/Tubing. Routing of instrument primary piping/tubing, including piping from the process connection through the root valve and the instrument primary piping/tubing, will be in accordance with the following criteria.

Special fittings such as reservoirs and other devices will be installed at differential pressure element connections as required by the process parameter to be measured and by the design of the instrument, in accordance with instructions of the instrument supplier.

Instrument primary piping or tubing for steam flow, liquid flow, and manometer level measurement systems should preferably slope downward from the primary element connections to the instrument. Instrument primary piping/tubing for fuel gas, compressed air, flue gas and airflow measurement systems should preferably slope upward from the primary element connections to the instrument. If these requirements cannot be met, special venting or drain provisions will be required. Horizontal runs must have a slope of not less than 1/2 inch per foot and must be adequately supported to maintain a constant slope.

D.3.2.1.5 Support of Instrument Piping/Tubing. Instrument primary piping will be supported in accordance with support requirements for process piping. Instrument primary tubing will be continually supported using unistrut or angle iron. Pneumatic signal and air supply tubing will be continuously supported and will normally be provided by tubing tray.

D.3.2.2 Thermowells and Protecting Tubes

Fluid system temperature sensors will be equipped with threaded thermowells and will be made of one-piece, solid bored Type 316 stainless steel of stepless tapered design. Threaded temperature wells in lines operating above 600 psi will be seal welded after installation.

Thermowells in main steam and feedwater piping will be designed to prevent damage caused by vortex-induced vibration over the range of velocities encountered in normal service in accordance with ASME Temperature Measurements.

All thermowells in steam piping will be installed and seal welded after steam blow to avoid exposure to vibration damage. For steam blow, the connections will be plugged by screwed plugs. All other thermowells will be installed prior to hydrostatic testing.

Temperature detectors in exhaust gas ducts will be mounted in protecting tubes to provide mechanical support and to permit replacement while in operation. Protecting tubes will be made of Type 316 stainless steel not smaller than 1/2 inch with 1-1/2 inch screwed pipe bushings tack welded to the tubes for attachments and insertion adjustments to the duct. Duct connections will consist of screwed couplings or adapter flanges welded to the ducts, into which the bushings on the protecting tubes can be threaded. Duct connections will be located to minimize the effect of temperature stratification within the ducts.

Temperature test points will have thermowells, caps, and plugs.

D.3.2.3 Thermocouples and Resistance Temperature Detectors

Temperature detectors will preferably be thermocouples. Thermocouples will preferably be chromel-constantan Type E with Type EX extension cable. Thermocouples and extension cable will comply with the standard limits of error in accordance with ANSI. The elements as a rule will be separate from ground (ungrounded).
Resistance temperature detectors (RTDs) will be of the three wire, 100 ohm platinum type. All RTDs for measurement of the fluid system temperature will be ungrounded, metal sheathed, ceramic packed, and suitable for the design temperature, pressure, and velocity of the fluid system.

Thermocouples and RTDs will have sheathed elements spring-loaded to provide good thermal contact with the well or protecting tube. The sheath will be made of stainless steel and have magnesium oxide insulation. All connection heads will be weatherproof, with screwed covers, and supported from the well by a stainless steel extension nipple.

D.3.2.4 Transmitters

Transmitters will be used to provide the required 4 to 20 mA DC signals for all control systems. Transmitters will be of the electronic two wire type, capable of driving a load up to 750 ohm, designed with provisions for zero and span adjustments.

D.3.2.4.1 Static Pressure and Differential Pressure Transmitters. Sensing elements for static pressure and differential pressure transmitters will be of either the capacitance or strain gauge type.

For steam and water services, static pressure transmitters will be equipped with a two-valve manifold, and differential pressure transmitters will be equipped with a five-valve manifold. Manifolds will be constructed in accordance with ANSI. Direct manifold mounting of the instrument to the manifold is preferred.

Pressure test points will have isolation valves and caps.

D.3.2.4.2 <u>Level Transmitters</u>. Sensing elements for level transmitters will be of the following types:

- Static head devices for vessels exposed to atmospheric pressure; air bubbler type devices may be used if absorption of air by the liquid is not objectionable. (Level transmitters of this type are the same as static pressure transmitters).
- Differential pressure type with constant head chamber for high-pressure and temperature applications where installation of float cage becomes impractical. (Level transmitters of this type are the same as differential pressure transmitters).
- Displacement float type or differential pressure type for enclosed vessels.
- RF admittance, or ultrasonic type, for specialized applications.

D.3.2.4.3 <u>Flow Transmitters</u>. Flow transmitters for general applications will be of the differential pressure type:

<u>Primary Elements</u>. Flow nozzles will be used for critical measurements where weld-in construction is required. Installation of flow nozzles and pressure taps will be made in the flow element manufacturer's shop as required.

Paddle type orifice plates will be used for other flow measurements where flanged construction and higher pressure loss are acceptable. Orifice plates will be made of stainless steel. Orifice flanges will be of the raised face weld neck or slip-on type with dual sets of taps.

Construction and installation of flow nozzles and orifices will conform to the requirements of ASME and discharge coefficients will be predicted in accordance with data published by ASME.

Annubars, piezometers, and pitot tubes will be used for measuring flows in large pipes or ducts where installation of nozzles or orifice plates is impractical.

<u>Secondary Elements</u>. Secondary elements for differential type flow sensors will be strain gauge or capacitance type differential pressure transmitters. Square root extraction required for the DP transmitters will be performed electronically in the control system, which receives the transmitter output signal.

D.3.2.5 Temperature, Pressure, Level, and Flow Switches

Temperature, pressure, level, and flow switches will generally be single-pole, double-throw (two Form C contacts) for each actuation point.
Where standard switch ranges allow, switches will be applied so that the actuation point is within the center one-third of the instrument range. The switch set point will be adjustable. Contacts will be of the snap-acting type.

Switching elements of moving float and displacement float type level switches will have float and body construction appropriate to the service conditions of the systems to which they are connected. Switch elements will be of the vibration resistant, snap-acting type magnetically coupled to the float.

D.3.2.5.1 Temperature Switches. Temperature switches will be actuated by filled-bulb type elements equipped with standard length armored capillary tubing.

D.3.2.5.2 Pressure Switches. Pressure switches will be actuated by disk or diaphragm type elements.

D.3.2.5.3 Level Switches. Level switches will be actuated by elements of the following types:

- Static head devices for vessels exposed to atmospheric pressure. (Level switches of this type are the same as static pressure switches.)

- Differential type for high-pressure and high temperature applications. (Level switches of this type are the same as differential pressure switches.)

- Displacement float type or differential type for enclosed vessels and sumps.

- Moving float type for open tanks and sumps.

- RF admittance, or ultrasonic type, for specialized applications.

D.3.2.5.4 Flow Switches. Variable area or differential pressure type actuating elements will be used for low flow and low-pressure applications.

D.3.2.6 Local Indicators

D.3.2.6.1 Local Temperature Indicators (Thermometers). Thermometers for local mounting will be 4.5 inch dial with white faces and black scale markings, bimetal actuated thermometers, or an acceptable equal. Dial scales will be such that the normal operating range is in the middle third of the dial range. Thermowells will be furnished for all thermometers.

D.3.2.6.2 Local Pressure Indicators (Pressure Gauges). Gauges for control air supply and signal pressures integral to an instrument will be in accordance with the instrument manufacturer's standards. All other gauges will be 4.5 inch minimum dial size, or an acceptable equal. Dial scales will be such that the normal operating range is in the middle third of the dial range. In general, pressure instruments will have linear scales with units in psig. Gauges for fluids which may be corrosive to the gauge internals will be furnished with glycerin filled cases and diaphragm seals. Pressure indicators on pulsating services will have pulsation dampeners. Gauges used in compressed gas applications or those equipped with diaphragm seals will not be furnished with pulsation dampeners.

D.3.2.6.3 Local Level Indicators (Gauge Glasses). Tubular gauge glasses will be used for low-pressure applications. Transparent or reflex gauges will be used for high-pressure applications. All gauge glasses will be equipped with gauge valves including a safety ball check.

D.3.2.6.4 Flow Indicators. Sight flow and variable flow indicators will be used for low-pressure and low temperature applications. The use of sight and variable flow indicators will be restricted to applications where quantitative measure of flow is not required.

Flow indicators for high-pressure and high temperature applications are not anticipated.

D.3.2.7 Solenoid Valves

Solenoid coils will generally be high temperature construction and will be designed for continuous duty. Three-way solenoid valves will be designed for universal operation so that the supply air may be connected to any port. Solenoid enclosures will be NEMA 4.

D.3.3 Plant Control Systems

D.3.3.1 Electronic Control Systems

The majority of plant equipment control and information functions will be implemented in the Distributed Control System (DCS). The combustion turbine control systems and steam turbine control systems will interface with the DCS through redundant datalinks and a limited complement of hard-wired I/O for operator actions and information display; however, the equipment control and protection logic will be implemented in the proprietary control systems provided by the respective equipment suppliers.

The DCS will be a microprocessor-based system composed of functionally distributed redundant (modular) processors, input/output modules, and operator interface devices, all connected via a redundant communications network Each system component connected to the communications network will be assigned a specific control or information task. All components will have the capability to communicate with one another through the communications network.

Input/output modules will be used for interfacing with transmitters and other sensors, final control elements, motor starters, breakers, and other plant equipment located throughout the plant. The I/O modules containing inputs/outputs used for control functions will be connected directly to the individual control processors so that a failure of the communications network will not affect the availability of the inputs/outputs necessary for execution of the control functions of the system. Where control information is transmitted between processors via the data highway, the overall security and response times of the control loops and digital control operations will be evaluated for acceptability. To the extent practical, the system will be organized so that the program within a processing unit will stand alone without dependence upon another processing unit or loop communications. Where remote I/O cabinets are used, they will be located in protected, ventilated (or air-conditioned) environments as appropriate for solid-state electronics, in accordance with the manufacturer's recommendations.

CRT based operator work stations will be provided in sufficient quantities to allow for ease of operation of the plant control systems. Each operator work station will be designed for point-and-click initiation of operator control commands. "Hard-wired" devices such as push buttons and indicators will be limited to those required by codes and regulations, and those necessary for hard-wired emergency shutdown push buttons in the unlikely event of control system failure.

The DCS will be designed so that no single failure of any equipment or power source will interrupt or disrupt any control function, nor will any single failure cause any controlled equipment to change status unless specifically required in accordance with the design. System outputs controlling redundant or parallel process equipment will be assigned to minimize the impact of an output card failure. In general, the use of redundant DCS outputs will be avoided. In cases of a failure of a single system input transducer or of an input module serving only that transducer, a predicted DCS system control response to the failure will be allowable. All such failures, however, will be alarmed.

The DCS will include spare capacity and equipment, and provisions for future expansions.

The DCS design will incorporate functional and component redundancy to ensure maximum reliability during system operation. Each of the processing units performing control and alarm functions will contain a pair of completely duplicate processors. One processor of the pair will be active; the other processor will be operating in a hot standby mode and will be continuously updated to be aware of the status of the active processor. In the event of a failure in the active processor, all functions will instantly be assumed by the standby processor. The transfer to the standby processor will be alarmed.

The system configuration will be such that no single component failure of the communication network will degrade other components within the system.

Redundant and secure power supplies will be provided for all control components in the system. Peripheral devices such as printers and copiers will be powered from a vital power source in the plant.

The DCS will be equipped with a diagnostic package that includes both hardware and software to detect system malfunctions and equipment failure. The occurrence of any malfunction or equipment failure will be alarmed instantly. The diagnostic package will be capable of pinpointing the defective component down to the card level.

The DCS will be designed to react in a predictable manner to certain failures:

- Upon system logic failure, as detected by system diagnostics, a controller transfers to its backup. If the backup is unavailable, the controller outputs will fall to a predictable state and will enable any manual shutdown facilities, which are appropriate to provide orderly shutdown of equipment.

- Upon system logic power supply failure, the controller will transfer to its backup. If the backup is unavailable, the system outputs will fail to a de-energized state.

- Upon power failure to an active or running controlled device or equipment, the system will react in a predetermined manner, either to command a restart of the equipment upon power resumption, or to cycle the logic to a status requiring equipment shutdown.

The response time of the system will be sufficient to maintain control over the plant processes under all system operating conditions including extreme plant upset conditions with all points in alarm. The response time is the total elapsed time for transmission of data through the system communication path. This time will include all communication time from processor to processor, I/O scans, nodes, gateways, operator work stations, and associated equipment internal to the system. The system response time will be as follows:

Function	Nominal Response (msec)
Monitoring/Information	2,000
Modulating Control	
Slow Loops	1,000
Fast Loops	250
Manual Control	1,000
Motor Control	1,000
Sequence-of-Events and Alarm Monitoring	1

D.3.3.1.1 <u>Equipment Function</u>. The DCS will provide modulating control, digital control, monitoring, alarming, logging, data archiving, and indicating functions for the plant systems. The following functions will be provided:

- Overall control of the combustion turbine generator, heat recovery steam generator (HRSG), steam turbine generator, and other systems in a coordinated response to unit load demands.
- Sequential combined cycle plant startups and shutdowns initiated by the plant operators.
- Control of the balance-of-plant process equipment, including the steam-feedwater-condensate cycle, auxiliary cooling water, water quality control systems, cycle chemical feed system, and other process systems.
- Operator interface for the turbine generator controls for normal or automatic operation.
- Operator interface for the auxiliary electric system.
- Visual and discernible audible alarms for abnormal events based on field signals or software generated signals from the systems, processes, or equipment.
- Consolidated sequence-of-events recording for each combustion turbine, steam turbine, and balance-of-plant systems to assist with diagnostic evaluation of plant upsets and trips.
- Operator interface through control consoles consisting of CRTs and printers.
- On-line hardware and software diagnostics.

- On-line programming and logic changes with tuning capability.

- Monitoring of plant equipment and process parameters. This information will be provided to the plant operators in a meaningful format.

D.3.3.1.2 Major Components. The DCS will include the following equipment:

- Distributed I/O cabinets containing the system input/output equipment and wiring terminations for process sensing and control equipment interface. These I/O cabinets will be located in areas of high concentration of field equipment that interfaces with the DCS.

- Distributed processing unit cabinets containing the redundant processing units, data highway communications equipment, and power supplies.

- Communication interfaces between the DCS and proprietary control systems furnished with major equipment packages.

- Redundant data highway to provide communication between the various components of the DCS. The redundant data highway cables will be routed through separate raceway systems to provide proper isolation.

- Operator work stations, each composed of color CRTs and a cursor control (trackball or mouse), to provide the normal interface between the operator and the plant processes and equipment being controlled or monitored. Alarm functions will also be displayed on these work stations.

- Printers to provide the operator with a hard copy record of logs, reports, system events, and CRT displays.

- Operator/engineer's work station containing the CRT-based, operator/ engineer station to provide the interface between the plant engineer and the plant processes and equipment for control system tuning, system program development and modification, and CRT graphic display development and modification. A printer will also be located on the console to provide the engineer logs and special reports, and documentation of system programming changes.

- Facilities for historical storage and retrieval will also be provided. Both analog values and digital status information will be stored. Each data point will have an individually selectable collection frequency.

Control systems supplied with individual vendor's equipment will, to the extent practical, be designed to be integrated into the plant DCS.

Operator work station displays will provide manual/automatic control station interface to the modulating control system. The displays will provide for operator adjustments of set point, bias, output, and manual/automatic control switching and indication of the associated station status and process values.
Operator work station displays will also provide start and stop or open and close commands to motor-operated equipment. Running, stopped, open, closed, and automatic trip status feedback and automatic/standby mode status will be displayed for the operator.

D.3.3.2 Pneumatic Controllers

The use of pneumatic controllers will be minimized but may be used for the following applications:

- Control loops which require only proportional or proportional plus reset action, but require no remote manual positioning by the control room operator.

- Control loops that do not require any interface with any receiver installed in the control room.

D.3.4 Motor Controls

D.3.4.1 Motor Interlocks

Motor interlocks will be designed in accordance with the following criteria.

D.3.4.1.1 Protective Interlocks. The protective interlocks for each motor and its associated equipment will be designed as follows:

- To prevent the motor from being started if the starting permissives required for safe operation are not satisfied.

- To automatically stop the motor under unsafe operating conditions when any action by the operator may be too slow to prevent the motor and its associated equipment from being damaged.

- To automatically start any standby equipment as a result of a motor trip and/or as required by the process.

- To provide outputs to inform the operator of the equipment status at all times.

- To provide outputs to alert the operator when any critical operating parameter is approaching its limit or when an abnormal operating condition occurs.

D.3.4.1.2 Standby Starts. Components in a system, such as turbine AC and DC lube oil pumps, which are paired to back up each other will have a standby mode imposed upon the protective interlock scheme. If the redundant pump is in the standby mode when the operating pump is tripped, or a process parameter indicates that the operating pump has failed, the standby pump will standby-start. After a pump has started in the standby mode, the pump will not stop automatically, except on a trip condition. An alarm will be generated to alert the operator that the pump has standby-started.

D.3.4.1.3 Automatic Starts and Stops. Equipment in some systems will operate in an automatic mode in which the starting and stopping of a motor are initiated automatically. An example of the automatic mode would be a tank fill pump that automatically starts at a low level and stops at a high level. Automatic motor actuations will not be alarmed unless the automatic action is initiated by a protective interlock.

D.3.4.2 Sequential Controls

Sequential controls apply control logic to a system or group of equipment. The basic functions are to coordinate the operation of all components within a functional group and to automatically start/stop or open/close all components in a predetermined sequence without the operator initiating any step-by-step control during the process. Sequential controls are typically found in vendor-furnished package systems, such as demineralizers and water treatment systems, and are generally implemented in programmable logic controllers.

D.3.4.3 Hardware Selection

D.3.4.3.1 Logic Systems. The main plant controls will utilize DCS type hardware. Controls purchased as part of an equipment package may utilize electromechanical or solid-state hardware, or may be hybrid.

D.3.4.3.2 Local Control Hardware. Small fans and pumps may be controlled by local control switches, if advantageous, and no intervention is required by the control room operator.

D.3.5 Location of Control Equipment

Control equipment refers to the control devices used to implement the modulating control and motor controls systems.

All pneumatic controllers will be field-mounted. All other control devices will be either mounted on a control console/panel, in a control cabinet, or on local stands.

D.3.5.1 Control Areas

Control areas will include the control room, local equipment buildings supplied by the combustion turbine supplier, and local areas in which local control stations and local control panels are located.

D.3.5.1.1 Control Room. The control room will contain the DCS, combustion turbine, and steam turbine operator workstations mounted on the control console from which the operator will conduct all normal and emergency operations of the unit.

The alarm and log printers will also be located in the control room.

D.3.5.1.2 Electronic Equipment Room. The electronic equipment room for the installation of control equipment, computer cabinets, and other solid-state electronic equipment will be provided in an area adjacent to the control room. The electronic equipment room will be environmentally controlled.

D.3.5.1.3 Local Control Areas. Local control areas will be established for systems where it is advantageous to have operator control in the vicinity of the equipment being controlled. The combustion turbine controls fall under this category.

Each of these systems will be provided with sufficient local control devices for a local operator to initiate a startup or shutdown sequence with provisions for manual control of major power-operated components within the system independent of the sequential operation.